

Form PTO-1449	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTY. DOCKET NO. 30-5000-(4015) Div. 1	PRIORITY SERIAL NO. 09/449,025
LIST OF ART CITED BY APPLICANT (Use several sheets if necessary)		APPLICANT Shozo Nagano et al.	
		PRIORITY FILING DATE November 24, 1999	PRIORITY GROUP 1775

U.S. PATENT DOCUMENTS							
*Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
	AA	5,972,192	10/1999	Dubin et al.			Jc868 U.S. PTO 09/784234
	AB	5,719,447	02/1998	Gardner			
	AC						
	AD						
	AE						

FOREIGN PATENT DOCUMENTS							
		Document Number	Date	Country	Class	Subclass	Translation
							Yes No
	AF						

OTHER REFERENCES (including Author, Title, Date, Pertinent Pages, Etc.)			
	AG		Electromigration Properties of Copper-Zirconium alloy Interconnects, Y. Igarashi et al., <i>J. Vac. Sci. Technol. B</i> 16(5), Sep/Oct. 1998, p. 2745-2750.
	AH		Directional and Preferential Sputtering-Based Physical Vapor Deposition, S.M. Rossnagel, 1995 Elsevier Science S.A., p. 1-12.
	AI		Excellent Electro/Stress-Migration-Resistance Surface-Silicide Passivated Giant-Grain Cu-Mg alloy Interconnect Technology for Giga Scale Integration (GSI), T. Takewaki et al., 1995 IEEE, p. 95-253-95-256.
	AJ		Materials Issues in Copper Interconnections, J.M.E. Harper, et al., <i>MRS Bulletin/August</i> 1994, p. 23-29.
	AK		Preparation of Low Resistivity Cu-1 at. %Cr Thin Films by Magnetron, C. Cabral, Jr., et al., <i>Journal of the Institute of Metals</i> , June 1951, p. 185-208.
	AL		International Critical Tables of Numerical Data, Physics, Chemistry and Technology, National Research Council of the United States of America, Volumes I-VII, 1933, 6 pages.
EXAMINER		DATE CONSIDERED	
S-38		7/1/02	
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			

Form PTO-1449 <div style="border: 2px solid black; border-radius: 50%; padding: 10px; display: inline-block; transform: rotate(-15deg);"> OIP E 3066 322 APR 12 2001 PATENT TRADEMARK OFFICE </div>		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTY. DOCKET NO. 30-5000-(4015)-Div1		SERIAL NO. 09/784,234		
LIST OF ART CITED BY APPLICANT (Use several sheets if necessary)				APPLICANT Shozo Nagano et al.		#5		
				FILING DATE February 14, 2001		GROUP Unknown 1212		
U.S. PATENT DOCUMENTS								
*Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate	
R	AA	6,113,761	09/05/00	Kardokus et al.	204	298.13		
R	AB	6,093,966	07/25/00	Venkatraman et al.	257	751		
	AC							
	AD							
	AE							
	AF							
	AG							
	AH							
	AI							
	AJ							
	AK							
FOREIGN PATENT DOCUMENTS								
		Document Number	Date	Country	Class	Subclass	Translation	
							Yes	No
R	AL	01096376 A	14.04.89	Japan (ABSTRACT)	1	1		
R	AM	10287939	27.10.98	Japan (ABSTRACT)	1	1		
	AN							
	AO							
	AP							
OTHER REFERENCES (including Author, Title, Date, Pertinent Pages, Etc.)								
R	AR	0	Phillips et al., <i>The Effect of Certain Solute Elements on the Recrystallization of Copper</i> , 81 JOURNAL OF THE INSTITUTE OF METALS 185-208 (1953).					
R	AS	0	ABSTRACT: Pierson et al., <i>Total sputtering yield of Ag/Cu alloys for low energy argon ions</i> , § B NUCL. INSTRUM. METHODS PHYS. RES. 108(3), pp. 290-9 (1996).					
	AT							
EXAMINER				DATE CONSIDERED				
S. If				7/1/02				
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.								

Form PTO-1449

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICEATTY. DOCKET NO.
30-5000-(4015)-Div1SERIAL NO.
09/784,234LIST OF ART CITED BY APPLICANT
(Use several sheets if necessary)APPLICANT
Shozo Nagano et al.

#6

FILING DATE
February 14, 2001GROUP
Unknown 1742

U.S. PATENT DOCUMENTS

*Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
↖	AA	3,666,666	05/30/72	Haertling	252	62.9	
	AB	3,923,675	12/02/75	Mazdiyasni et al.	252	62.9	
	AC	5,066,617	11/19/91	Tanemoto et al.	501	134	
↘	AD	5,314,651	05/24/94	Kulwicki	284	65	~2
	AE						
	AF						
	AG						
	AH						
	AI						
	AJ						
	AK						

FOREIGN PATENT DOCUMENTS

		Document Number	Date	Country	Class	Subclass	Translation	
							Yes	No
↖	AL	06081138 J	03.01.94	Noda et al.	1	1	Abstract	
↘	AM	09249957 A	22.09.87	Watanabe et al.	1	1	Abstract	
	AN							
	AO							
	AP							

OTHER REFERENCES (including Author, Title, Date, Pertinent Pages, Etc.)

↖	AR		Foster, Composition and Structure of Sputtered Films of Ferroelectric Niobates, 8 THE JOURNAL OF VACUUM SCIENCE AND TECHNOLOGY, No. 1,
			pp. 251-255 (1971).
↖	AS		Haertling, Hot-Pressed Ferroelectric Lead Zirconate Titanate Ceramics for Electro-Optical Applications, 49 CERAMIC BULLETIN, No. 6,
			pp. 564-567 (1970).
	AT		

EXAMINER

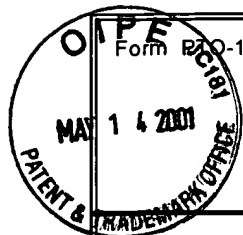
E Jg

DATE CONSIDERED

7/1/02

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

#9



Form PTO-1449

 U.S. DEPARTMENT OF COMMERCE
 PATENT AND TRADEMARK OFFICE

 ATTY. DOCKET NO.
 30-5000-(4015)-Div1

 SERIAL NO.
 09/784,234

 LIST OF ART CITED BY APPLICANT
 (Use several sheets if necessary)

 APPLICANT
 Shozo Nagano et al.

 FILING DATE
 February 14, 2001

 GROUP
 Unknown 1742

U.S. PATENT DOCUMENTS

*Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
✓	AA	3,963,934	06/15/76	Ormod	250	499	
	AB	4,132,614	01/02/79	Cuomo et al.	204	192 EC	
	AC	4,149,907	04/17/79	Wronski et al.	148	1.5	
	AD	4,159,909	07/03/79	Wilson	75	170	
	AE	4,198,283	04/15/80	Class et al.	204	298	
	AF	4,209,375	06/24/80	Gates et al.	204	192 R	
	AG	4,395,979	05/31/83	Pierce et al.	204	298	
	AH	4,545,882	10/08/85	McKelvey	204	192 R	
	AI	4,629,859	12/16/86	Reddy	219	121 LM	
	AJ	4,814,053	03/21/89	Shimokawato	204	192.15	
✓	AK	5,171,411	12/15/92	Hillendahl et al.	204	192.12	

FOREIGN PATENT DOCUMENTS

		Document Number	Date	Country	Class	Subclass	Translation	
							Yes	No
✓	AL	EP 0 882 813 A1	09.12.88	Europe (Takahashi)				
✓	AM	61084389 A2	28.04.86	Japan (Takewaki) - Abstract only				
✓	AN	61113740 A2	31.05.86	Japan (Tanaka) - Abstract only				
✓	AO	62127438	09.06.87	Japan (Tatsuta) - Abstract only				
✓	AP	63033174	12.02.88	Japan (Kazuka) - Abstract only				

OTHER REFERENCES (including Author, Title, Date, Pertinent Pages, Etc.)

✓	AR	✓	Dierckxsens et al., <i>Effect of trace elements on the recrystallization behavior of high purity oxygen-containing copper</i> , ERZMETAL 28(11), 496-500 (1975). Abstract only.					
✓	AS	✓	Lucke et al., <i>Physical Metallurgy Principles</i> , 5 ACTA MET. 298 (1957).					
✓	AT	✓	Pierson et al., <i>Total sputtering yield of Ag/Cu alloys for low energy argon ions</i> , NUCL. INSTR. AND METH. IN PHYS. RES. 108 B, pp. 290-299 (1996). Full text of article submitted in abstract earlier.					

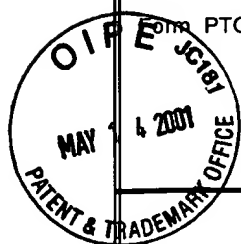
EXAMINER

S. Jp

DATE CONSIDERED

7/1/02

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.



Form PTO-1449

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICEATTY. DOCKET NO.
30-5000-(4015)-Div1SERIAL NO.
09/784,234LIST OF ART CITED BY APPLICANT
(Use several sheets if necessary)APPLICANT
Shozo Nagano et al.FILING DATE
February 14, 2001GROUP
Unknown 1742

U.S. PATENT DOCUMENTS

*Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
3	AA	5,215,639	06/01/93	Boys	204	192.12	
	AB	5,242,566	09/07/93	Parker	204	298.2	
	AC	5,268,236	12/07/93	Dumont et al.	428	636	
	AD	5,282,943	02/01/94	Lannutti et al.	204	192.12	
	AE	5,282,946	02/01/94	Kinoshita et al.	204	298.13	
	AF	5,336,386	08/09/94	Marx et al.	204	298.12	
	AG	5,397,050	03/14/95	Mueller	228	193	
	AH	5,490,914	02/13/96	Hurwitt et al.	204	299.12	
	AI	5,589,040	12/31/96	Nishimura	204	192.26	
	AJ	5,674,367	10/07/97	Hunt et al.	204	298.12	
3	AK	5,693,203	12/02/97	Ohhashi et al.	240	298.12	

FOREIGN PATENT DOCUMENTS

		Document Number	Date	Country	Class	Subclass	-Translation	
							Yes	No
	AL	63064211	22.03.88	Japan (Furukawa) - Abstract only				
	AM	63118033	23.05.88	Japan (Sumitomo Metal mining Co.) - Abstract only				
	AN	63235442 A2	30.09.88	Japan (Furukawa) - Abstract only				
	AO	1-96374	14.04.89	Japan				X
	AP	1-96376	14.04.89	Japan (Ishikura)			X	

OTHER REFERENCES (including Author, Title, Date, Pertinent Pages, Etc.)

	AR		
	AS		
	AT		

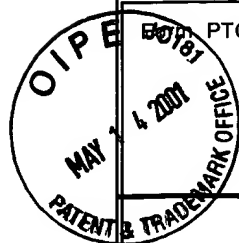
EXAMINER

S. Zg

DATE CONSIDERED

7/1/02

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.



PTO-1449

 U.S. DEPARTMENT OF COMMERCE
 PATENT AND TRADEMARK OFFICE

 ATTY. DOCKET NO.
 30-5000-(4015)-Div1

 SERIAL NO.
 09/784,234

 LIST OF ART CITED BY APPLICANT
 (Use several sheets if necessary)

 APPLICANT
 Shozo Nagano et al.

 FILING DATE
 February 14, 2001

 GROUP
 Unknown 1742

U.S. PATENT DOCUMENTS

*Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
	AA	5,772,858	06/30/98	Tepman	204	192.12	
	AB	5,833,823	11/10/98	Gruenenfelder et al.	204	298.09	
	AC	5,846,389	12/08/98	Levine et al.	204	192.1	
	AD	6,010,583	01/04/00	Annavaarapu et al.	148	513	
	AE	6,028,003	02/22/00	Frisa et al.	438	653	
	AF	6,039,855	03/21/00	Wollenberg	204	298.12	
	AG	6,042,752	03/28/00	Mitsui	252	520.1	
	AH	6,068,742	05/30/00	Daxinger et al.	204	298.09	
	AI	6,086,735	07/11/00	Gilman et al.	204	298.12	
	AJ	6,117,281	09/12/00	Novbakhian	204	192.16	
	AK	6,121,685	09/19/00	Gardner	257	762	
	AL	6,139,701	10/31/00	Pavate et al.	204	192.17	

FOREIGN PATENT DOCUMENTS

		Document Number	Date	Country	Class	Subclass	Translation	
							Yes	No
	AM	02301585	13.12.90	Japan (Furukawa) - Abstract only				
	AN	05078195 A2	30.03.93	Japan (Sugiura) - Abstract only				
	AO	10-287939	27.10.98	Japan (Eguchi)			X	
	AP							

OTHER REFERENCES (including Author, Title, Date, Pertinent Pages, Etc.)

AR		
AS		
AT		

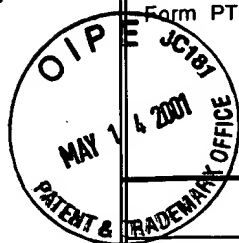
EXAMINER

S. Jg

DATE CONSIDERED

7/1/02

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.



Form PTO-1449

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICEATTY. DOCKET NO.
30-5000-(4015)-Div1SERIAL NO.
09/784,234

LIST OF ART CITED BY APPLICANT

(Use several sheets if necessary)

APPLICANT
Shozo Nagano et al.FILING DATE
February 14, 2001GROUP
~~Unknown~~ 1742

U.S. PATENT DOCUMENTS

*Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
9	AA	09/556,488		Kardokus et al. (as filed)	1	1	04/21/2000
	AB	09/615,474		Kardokus et al. (as filed and as amended)	1	1	07/13/2000
13	AC	09/714,714		Kardokus (as filed)	1	1	11/15/2000
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						
	AJ						
	AK						

FOREIGN PATENT DOCUMENTS

		Document Number	Date	Country	Class	Subclass	Translation	
							Yes	No
	AL							
	AM							
	AN							
	AO							
	AP							

OTHER REFERENCES (including Author, Title, Date, Pertinent Pages, Etc.)

	AR		
	AS		
	AT		

EXAMINER

S. 38

DATE CONSIDERED

7/1/02

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Form PTO 1449 <div style="border: 2px solid black; border-radius: 50%; padding: 10px; display: inline-block; transform: rotate(-45deg);"> OIPE JUN 14 2001 U.S. PATENT & TRADEMARK OFFICE </div>		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTY. DOCKET NO. 30-5000-(4015)-Div1		SERIAL NO. 09/784,234	
OF ART CITED BY APPLICANT (Use several sheets if necessary)				APPLICANT Shozo Nagano et al.		#10	
FILING DATE February 14, 2001				GROUP 1742			

RECEIVE
 JUN 19 2001
 TC 1700

U.S. PATENT DOCUMENTS							
*Examiner Initial	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate	
7	AA	5,023,698	06/11/91	Kobayashi et al.	357	67	
	AB	5,833,820	11/10/98	Dubin	204	212	
	AC	5,895,562	04/20/99	Dubin	205	137	
C	AD	6,162,726	12/19/00	Dubin	438	678	
	AE						
	AF						
	AG						
	AH						
	AI						
	AJ						
	AK						

FOREIGN PATENT DOCUMENTS							
Document Number	Date	Country	Class	Subclass	Translation		
					Yes	No	
AL	0 335 383 A2	30.03.89	Europe (Kobayaashi et al.)	1	1		
AM	0 626 722 A1	09.02.93	Europe (Ohmi)				
AN	WO 00/73531 A2	07.12.00	WIPO (Kardokus et al.)				
AO							
AP							

OTHER REFERENCES (including Author, Title, Date, Pertinent Pages, Etc.)			
7	AR	✓	Massalski, 18 BINARY ALLOY PHASE DIAGRAMS 18-19, 928-929, 936-937, 964-965 (1986).
	AS		
	AT		

EXAMINER <div style="text-align: center; font-size: 1.5em;">S. J.</div>	DATE CONSIDERED <div style="text-align: center; font-size: 1.5em;">7/1/02</div>
--	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Form PTO-1449

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICEATTY. DOCKET NO.
30-5000-(4015)-Div1SERIAL NO.
09/784,234LIST OF ART CITED BY APPLICANT
(Use several sheets if necessary)APPLICANT
Shozo Nagano et al.

#11

FILING DATE
February 14, 2001GROUP
1742

U.S. PATENT DOCUMENTS

*Examiner Initial	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
	AA					
	AB					
	AC					
	AD					
	AE					
	AF					
	AG					
	AH					
	AI					
	AJ					
	AK					

RECEIVED
JUL 13 2001
TC 1700

FOREIGN PATENT DOCUMENTS

	Document Number	Date	Country	Class	Subclass	Translation	
						Yes	No
	AL						
	AM						
	AN						
	AO						
	AP						

OTHER REFERENCES (including Author, Title, Date, Pertinent Pages, Etc.)

B	AR	6	Brizzolara et al., Low Energy Sputtering of Eutectic Ag/Cu Alloys, B26 NUCLEAR INSTRUMENTS AND METHODS IN PHYSICS RESEARCH 528-531
			(1987).
	AS		
	AT		

EXAMINER

S. J. 8

DATE CONSIDERED

7/1/02

RECEIVED
JUN - 7 2001
TC 1700 MAIL ROOM

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Form PTO-1449		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTY. DOCKET NO. 30-5000-(4015)-Div1		SERIAL NO. 09/784,234	
LIST OF ARTS CITED BY APPLICANT (Use several sheets if necessary)				APPLICANT Shozo Nagano et al. #12			
				FILING DATE February 14, 2001		GROUP 1742	
U.S. PATENT DOCUMENTS							
*Examiner Initial	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate	
	AA	4,676,827	6-30-87	Hosoda et al.			
	AB	4,986,856	1-22-91	Tanigawa et al.			
	AC	5,077,005	12-31-91	Kato			
	AD	6,117,781	9-12-00	Lukanc et al.			
	AE	6,117,782	9-12-00	Lukanc et al.			
	AF	6,121,150	9-19-00	Avanzino et al.			
	AG	6,197,433	3-8-01	Hatano			
	AH						
	AI						
	AJ						
	AK						
FOREIGN PATENT DOCUMENTS							
		Document Number	Date	Country	Class	Subclass	Translation
							Yes No
	AL						
	AM						
	AN						
	AO						
	AP						
OTHER REFERENCES (including Author, Title, Date, Pertinent Pages, Etc.)							
	AR						
	AS						
	AT						
EXAMINER S. J. S.				DATE CONSIDERED 7/1/02			

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.